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Entrepreneurship in biology and biology-related courses as a means of employment and sustainable economic development in Nigeria

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ABSTRACT

Unemployment is one of the major problems facing the Nigeria society and the entire world at large. Every year, large numbers of employable graduates are produced from the various Nigerian Educational Institutions (both secondary and tertiary) without the hope of job opportunities. Entrepreneurship, being generally regarded as an integral part of business, often serves as a big or major engine room for job opportunities and economic growth of a nation. Entrepreneurship exists when a person or group of people develop a new approach to an old business or idea. Biology as an applied field of study is diverse in nature and in conjunction with other biology-related courses, is capable of providing job opportunities and entrepreneurial businesses for those who studied it. The use of biological knowledge to serve human needs is not new. Human society has tapped the knowledge of biology for millennia to produce food, beverages, fibres and other agro-allied products. The advent of modern technologies coupled with new biological knowledge has vastly expanded the application of biology in different areas of entrepreneurial activities. It is pertinent to note that a series of professions that are of vital economic importance to man and nation's development have their origin traced to biology thus, proper understanding of the principles of biology and their application is an important force in the realization of a healthy and productive life which is the basis on which investments and enterprises are anchored. This paper therefore highlights various possible biology-oriented entrepreneurial activities that can be embarked upon and developed, in order to surmount the ever increasing problem of unemployment in the society, and transform people, especially the youth to employers of labour rather than being job seekers. It also examined the various challenges faced in the application of the principles of biological science to the development of entrepreneurial businesses and makes some recommendations by which these problems can be surmounted.

Keywords: Entrepreneurship, Biology, millennia, unemployment, investment, surmount

1. ENTREPRENEURSHIP & ENTREPRENEURS

The term entrepreneurship has been defined in various ways by different scholars. Bednarzick, (2000), defined entrepreneurship as a way or process of developing a new approach to an old business or idea. Audretsch, David and Keibach (2004) described entrepreneurship as the capacity and willingness to develop, organise and manage a business venture along with any of its risks in order to make profit. Iwuamachi & Ofoegbu (2011), defined entrepreneurship as an activity that involves the discovery, evaluation and exploitation of opportunities to introduce new goods and services, ways of organising markets, processes and raw materials to meet people's demand and improve their standard of living. It is the manifest ability and willingness of individuals on their own, in teams, within and outside existing organisation to perceive and create new economic opportunities (i.e. new products, new production methods, new organizational schemes and new product-market combination) and to introduce their ideas in the market, in the face of uncertainty and other obstacles by making decisions on locations, farms and the use of resources and institutions (Iwuamachi & Ofoegbu, 2011).

Entrepreneurship is the heart of national development. However, entrepreneurial spirit is characterized by innovation and risk-taking and is an essential part of a nations ability to succeed in an ever changing and increasing competitive global market place (Ibiyinka Ogunlade, 2017; Femi Olajuyigbe, 2017).

Ezema (2000), described an entrepreneur as the owner of a business who is responsible for the initiation and organisation of the enterprise out of a desire to maximise profit (Ezema, 2000).

In other, words, entrepreneurs play vital roles in raising the level of productivity in the economy by harnessing and utilizing available resources prudently and efficiently. By combining existing resources with innovative ideas, entrepreneur adds values through the commercialization of new products, creation of new jobs and building of new firms and establishments. (Audretsch, David and Keibach, 2004) The Global Economic Monitor (GEM) indicates that nations with higher levels of entrepreneurial activity enjoy strong economic growth. With too many entrepreneurs, levels of aspiration in a country may rise i.e. with increasing materials wealth vis-a-vis job opportunities, people's aspirations may increase. Entrepreneurs create job and employment. They are responsible for taking calculated risks that open up doors to progressively higher levels of economic growth. They are a veritable backbone on which the world and modern ideas continue to develop (Bednarzick, Robert, 2000).

Developed nations, all over the world owe their current prosperity, industrial and socio-economic advancement to the collective efforts of intrepid entrepreneurs, on whose innovations also rests the future prosperity of much of the developing world.

2. ENTREPRENEURSHIP IN NIGERIA

Nigeria is home to people of different ethnic groups (Ibos, Yorubas and Hausas) who are extremely resourceful and well known for their traditional entrepreneurial process.

Entrepreneur forces are relatively strong in Nigeria, as most people see entrepreneurial activities as what is primarily based on necessity due to the poor economic situation. But what we have failed to realise is that entrepreneurship development is the bedrock of all economic evolution of any nation.

Nigeria has entrepreneurs who had entrepreneurial mind-set prevalent at the time. They seized opportunity and were innovative and were able to develop business plans using ideas which they sourced from travellers, itinerant tradesmen and consumers of agricultural and manufactured products who benefited from activities like animal husbandry (ranching), poultry farming etc. The people of Ibo, Yoruba, and Hausa, all had their own entrepreneurs who were exposed to entrepreneurship opportunities outside their native areas. They had astute entrepreneurs who managed workers with skills in tanning, dying, wearing and metal-working.

Traditionally, the Ibos have specialized and excelled in buying and selling goods and have protected their entrepreneurial expertise in inventory control, management and distribution of goods which up till today, has remained their prevalent way of entrepreneurship. The Yorubas are predominantly town dwellers who practised small-scale domestic agriculture and area also known for trading and crafting.

With the advent of modern entrepreneurship (20th-21th century), these people have adapted to entrepreneurial activities, to the extent that some of their entrepreneurs have dabbled into importation, import-export, shipping, warehousing, freighting, food processing and preservation. One of the notable Nigerian entrepreneurs of international repute is Alhaji Aliko Dangote who is presently regarded as the African richest billionaire, trailed behind by Mike Adenuga and a host of others.

3. ROLE OF BIOLOGY IN ENTREPRENEURSHIP

Biology, as a branch of natural science is concerned with the study of life and life entails all living things both plants and animals. The word biology, according to Fatubarin (2004) was derived from two Greek words: "Bios meaning life" and "Logos meaning "study of", thus biology is considered as the study of life or study of organisms including their structure, anatomy, physiology, chemistry, functions, growth, evaluation, taxonomy, distribution and their environmental interactions. The modern biology is a broad field comprising of two major divisions (botany and zoology) each of which is further subdivided into many sub- branches. Biology is also studied in combination with other science courses, thus we have courses like biochemistry, biophysics, biotechnology, biography, biometry and a host of others (Idodo-Umeh, 1996). The importance of biology and its related courses, in promoting and sustaining entrepreneurial activities vis-a-vis nation's economic development cannot be over emphasized. The science of biology has virtually permeated all segments of the nation's economic sectors. Biology as an applied field of study is capable of providing job opportunities for those who study it. It is pertinent to know that a series of professions like agriculture, medicine, pharmacy, nutrition that are of vital importance to man and national development have their origin and operations traced to biological principles. This view was supported by Teng, (2008a), when he asserted that the influence of biological science is more likely to have a more significant effect on humans compared with other physical sciences. This is because most of human problems are more biological in nature. Biology, is built upon many disciplines for the purpose of achieving and sustaining the well-being of individuals in an ever-changing society. Its major aim centres broadly at developing life-coping scientific and moral attitudes such as identification, observation, accurate recording, measurement, communication, predicting hypothesis and making logical inferences. Learning of biology also helps to develop in learners, moral attributes or virtues such as open- mindedness, patience, curiosity, honesty, objectivity etc. All these skills and moral attributes, when fully acquired are useful for successful business ventures, problem solving and adaptation for individual's development (Teng, 2008). Thus, inculcation of these skills into students will enable them, on graduating, to develop interest in setting up biology-oriented entrepreneurial enterprises that will make them productive and self-reliant without waiting or searching for government's white collar jobs.

4. ENTREPRENEURSHIP IN BIOLOGY AND BIOLOGY-RELATED COURSES AS A MEANS FOR EMPLOYMENT

Roles of biology in agricultural entrepreneurship

Biology, being an applied field of study is built upon many disciplines for the purpose of achieving and sustaining the well-being of individuals in an ever-changing society. The 21st century has been touted as the "Biology Century" because of the many advances in human understandings of biology as a major field of science whose principles have contributed tremendously to the development of entrepreneurial activities especially in the area of food production vis-a-vis job creation and economic sustainability of the nation. For example, biology through agriculture (which is an annex of biology) has demonstrated tremendous impacts in the alleviation of world food problem, (Russel, Wolfe and McMillian (2008)). It has played a remarkable role in the discovery, development and production of improved crops. (Transgenic crops) which give greater and quality yields which are resistant to pests and diseases. This scientific (biological) discovery and innovation has enticed many graduate job-seekers to develop interest in crop farming and become entrepreneurs in food production, food processing and food exportation businesses. Our early ancestors domesticated plants and animals and with the selective breeding of preferred species, they formed the biological foundation for today's plant and animal varieties, many of which are vastly different from their original parents (Chukwurah, 1989). Majority of today's crop plants and animals are products of the application of biological knowledge or simply "Bioscience Enterprise". Bioscience enterprise, according to Teng, (20008a), is any commercial activity involving the application of biology and understanding of life processes to create economic values. It involves the production of raw bio-commodities, high quality seed materials using hybrids, food processing, tissue culture, biofertilizers, bio-pesticides and biofuels. Bioscience enterprise also involves the application and practice of bioremediation and bio-fermentation. All over the world, tremendous opportunities are provided by bioscience entrepreneurship to contribute to sustainable economic development (AAAS, 2010).

Food Processing

Food processing carried out either at home or in the food processing industries. Basically, food processing industries include canneries, slaughter houses, meat-packaging industries, sugar industries, vegetable-packaging industries etc. Food processing provides special benefits to the society such as toxin removal, preservation, all-season availability of foods particularly, with the

day-by-day increasing demand for nutritious foods (Teng, 2007b). It also ensures easy marketing and distribution of these food stuffs, and making many them safe for consumption by de-activating spoilage and pathogenic micro-organisms. Thus, food processing offers yet another unique opportunity for safe and secured food consumption, creating job opportunities and entrepreneurship development.

Some areas of biological importance in agriculture that leads to entrepreneurship development include:

Aquaculture

The role of biology in aquaculture cannot be under estimated. Aquaculture as a field, involves the rearing and culturing of aquatic flora and fauna. These include fishes, aquatic molluscs, crustaceans such as crabs, prawns, shrimps. Aquaculture also involves the culturing of live feeds for fish larvae, crabs fattening and seed rearing, shell craft and pearl culture (Crawford, 2002).

Aquaculture has been identified as a proffered and veritable solution to key problems such as food shortage (protein deficiency), malnutrition, food insecurity and livelihood insecurity, thus promoting job creation vis-a-vis wealth creation, foreign exchange earnings, coastal- rural development and empowerment among the unemployed, particularly the great majority of unemployed Nigerian youth and women who are poor and are seriously in need of financial empowerment. The aquaculture industry in Nigeria is mainly characterised by fish farming which is usually categorised in the fishery sector. In many countries including Nigeria, catfish has gained so much popularity. It is not a gain say that catfish propagation has actually permeated virtually all parts of Nigeria. Other fishes that are also largely cultured in Nigeria include Tilapia species, Carp, Heterotis and Hemichromis. The breeding and brooding of these fishes and prawns require intensive biological knowledge. The larvae of these fishes feed exclusively on biological plankton, particularly zooplankton which are cultured locally, either in the captive or the wild. With increasing demand for fish and fish products (usually regarded as the source of cheap protein supply) especially among the low income earners, interest in aquaculture is gaining national and international repute, hence more unemployed graduates are developing interest in fish farming thereby creating job opportunities for themselves and others.

Sea Weed Culture

This is the practice of cultivating and harvesting sea weeds. In its simplest form, it consists of the management of naturally found batches. In its most advanced form, it fully controls the life cycle of algae. Its products include Agar, Agarose, and thickening agents (Naylor, 1976). The main food species grown by aquaculturist include Gelidium, Pterocladia, and Laminaria.

Seaweed farming began in Japan as early as 1670 in Tokyo Bay, and the practice has since spread beyond Japan to countries like Philippines South Asia, Canada, Great Britain and USA. It was reported that in Philippines alone, over 40,000 people make their living through seaweed farming. The high demand in seaweed production provides plentiful job opportunities and entrepreneurship activities for the local community.

Aquarium

The quest for ornamental fishes has gradually paved way for global trade in aquarium. Most ornamental fishes posses high values for their attractive colouration pattern, graceful behaviours, peculiar body morphology and endemicity. Aquarium fishery has become a popular hobby and aquarium fish-selling is a popular trade in many countries of the world including Nigeria (Crawford, 2002).

The indigenous ornamental fishes which are available in the rivers are being neglected due to lack of awareness. Most of these fishes are caught before their fish maturity and sold in the market as food fishes. The culturing and raising of the ornamental fishes in any part of the world requires the knowledge and principles of biology especially in the area of reproduction.

Challenges Facing Entrepreneurial business in general and Biology in particular

For any entrepreneurship to succeed and make desirable profit, especially in an ever-changing and increasingly global market place, the major factors of production, which are labour, capital and land, in addition to the entrepreneur himself must be available. Traditional neoclassical theory holds that the economic growth of a country is determined by the availability of labour, capital and the level of technology present in the country. It must be noted that poor or low entrepreneurial skills and knowledge arising from inadequate educational and technological background, especially in the field of specialisation, often poses a serious setback to successful entrepreneurial accomplishment. For an entrepreneur to behave in an economically rational manner, he must have acquired some amount of general and professional knowledge, especially in the field of the chosen business on which to make policies and decisions that will assist in the smooth running of the business. It is this professional knowledge coupled with the

general knowledge, he then converts into economic knowledge by sifting through the knowledge and carving out the portion that could be exploited for the start of the business.

- Majority of people dabbling into business, especially biological businesses often have the general knowledge but lack the professional knowledge. This explains the reason why many biology-oriented entrepreneurship ventures do collapse along the way because of lack of professional knowledge or skill in the field of study.
- Capital plays a vital role in the establishment and running of a business. It forms the fulcrum on which the establishment of business and its day-to-day running is anchored. Many industrious biology and biology-related graduates in Nigeria now find it very difficult to secure venture capital to finance their entrepreneurial businesses due to the nation's economic recession. Also, gaining access to either short-term or long-term loan from banks or cooperative societies has become a herculean task for these industrious youth due to their inability to provide a commensurate collateral. These financial institutions tend to frustrate aspiring entrepreneurs with their ridiculous requirements such as huge collateral and unrealistic high interest rate, all aimed at discouraging these aspiring potential entrepreneurs. With these unfriendly practices by banks and other financial institutions, a lot of brilliant business ideas have been washed down the drain due to financial constraints confronted by these business-minded small scale entrepreneurs.
- Another major problem is associated with the tools and other materials needed for the business. Many of these tools and other materials needed for the smooth and efficient running of these businesses are mostly imported and their costs are too high for small scale entrepreneurs to purchase. For example, in fish farming business, tools such as fish mill machines for feed making, fish incubators, bioreactors for biofermentation and live feed organisms (*artemia larvae*) are so costly that small scale fish farmers may not be able to procure.
- The act of deforestation and hunting of animals (especially the endangered species) is another serious impediment hindering the success of biological entrepreneurial enterprises in Nigeria. When the vegetation is destroyed either through indiscriminate felling of trees or bush burning and the animals are hunted, killed or chased away, the adverse consequence is the total eradication of the entire ecosystem which can lead to the extinction of the flora and fauna inhabiting the ecosystem.

5. SUMMARY

The role of entrepreneurship in the economic development of any nation cannot be under-estimated. This is due to the fact that the profit made by entrepreneurs flows on an increase into the national income thereby increasing the nation's Gross Domestic Product (GDP). This individual is referred to as an entrepreneur. Biology as an applied field of study, is diversified in nature giving rise to many sub-units which provide different skills and principles for the initiation and creation of different entrepreneurial activities, many of which can lead to job creation thereby alleviating the problem of unemployment and enhancing the socio-economic development of the nation.

For example, biology through the different units of agriculture (which is an annex of biology) has made a remarkable impact in the area of food production through culturing, rearing and cultivation, processing, preservation and conservation. The result of these is self-sufficiency and greater reliance on locally made agro-allied products thereby reducing the thirst for imported goods and boosting export trade and foreign exchange earnings.

6. CONCLUSION

Entrepreneurship plays vital role in the socio-economic growth. Consequently, the progressive improvement in the level of joblessness which has given rise to an unprecedented increase in poverty level, it has become imperative for Nigerians, particularly the youth to close their eyes on white collar jobs that are not available and begin to direct their search light towards job-creating activities especially in the areas of biology. Biology is a pivotal knowledge component to meeting human's requirements and thereby contributing to sustainable development. As a bioscience, it offers great scope to meet the challenges of unemployment. This is because entrepreneurship in biology has the potential of equipping individuals with acceptable skills and self-reliance as a pathway for creating and generating gainful employment. Biology's contributions to entrepreneurship vis-a-vis national development can only be achieved through well planned and executed educational programs in schools and in adult populations. Individuals who are trained properly in biology stand a better chance in developing creative ability for job opportunities in some areas where others who are not biology-oriented have been overlooked.

Recommendations

All over the world, tremendous opportunities have been provided by biological science in its bid to contribute to the nation's economic growth, job creation and sustainable national development. To encourage, and sustain these laudable contributions, all impediments hindering the successful establishment and smooth running of biological entrepreneurial activities must be eliminated and measures put in place for promoting and encouraging potential entrepreneurs. For this to be achieved, the following recommendations are hereby suggested which, if strictly adhered to, will go a long way in removing many of these obstacles and pave way for successful establishment of biological businesses and other businesses in general:

- Most biological enterprises require indebt knowledge of professional skills especially in the area of the business.
- For successful establishment of biological entrepreneurship, efforts should be directed towards proper funding of science courses in the nation's educational institutions in order to equip these potential entrepreneurs the technical and professional know-how in the business, thereby fostering self-reliant science-oriented enterprises especially in manufacturing, culturing, rearing, cultivation, preservation, conservation and processing. In the same vein, there should be proper policy coordination and reforms in the educational curriculum that would prepare students for job creation rather than for job seeking.
- Most biological enterprises have their principles and experimental applications carried out in the laboratories. Thus, efforts should be geared towards provision of adequate and well-equipped science laboratories in all institutions of learning for proper training of manpower in experimental biology in preparation for biological entrepreneurship.
- Many of the biological specimens and raw materials used are collected from our vegetation and waters. Thus, efforts should be directed towards proper conservation of our forest and wildlife. In other words, laws should be enacted to guide against deforestation through indiscriminate felling of trees, bush burning, overgrazing, and soil pollution. The same law should also protect our wildlife against indiscriminate hunting, our water bodies against oil spillage and other forms of water pollutions.
- Tariffs on imported scientific and technological tools used for the smooth and efficient running of entrepreneurial activities should be reduced in other to boost the interest of potential entrepreneurs.
- Capital forms the pillar that anchors any entrepreneurship. Thus, in order to kindle the interest of the unemployed youth towards self-employment and job creation, government should formulate and implement policies that will make loans (short-term and long-term) or grants available for the youth at very reduced and affordable interest rates.
- Basic infrastructural facilities are essential ingredients for successful establishment and operations of viable entrepreneurship. Facilities such as good and accessible roads, regular electricity supply, good water, medical facilities should be provided by government so as to ensure a conducive and entrepreneurship-friendly environment for the entrepreneurs.
- An unsecured entrepreneurship is a business in futility. The problem of insurgency, ethnical and religious violence that often results in destruction of lives and properties should be seriously tackled by government if any business is to survive and blossom.
- No successful business can thrive in a shaky, turbulent and insecured political environment. In view of this, Nigerian constitution should be re-designed in such a way that will clearly spell out the rules and regulations guiding the conduct of political activities. Adherence to these rules and regulations will help in curbing political excesses that often pave way for unchallenged corruption. The laws should also ensure that all avenues of loopholes in all sectors of the nation's economy are blocked in order to reduce, if not completely eradicate corruption in its entirety.

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Conflicts of interests

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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